

## QUIZ NAVIGATION



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| Started on   | Friday, 11 October 2024, 6:53 PM |
| State        | Finished                         |
| Completed on | Friday, 11 October 2024, 6:58 PM |
| Time taken   | 5 mins 1 sec                     |
| Grade        | 8.00 out of 10.00 (80%)          |

## Question 1

ID: 50363

Correct

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SJ is a 27-year-old female who presents to your pharmacy clinic. Her past medical history is significant for allergic rhinitis and irritable bowel syndrome (IBS). Her current medications include desloratadine 5 mg PO daily, ciclesonide nasal spray (50 mcg/spray) two sprays in each nostril daily, folic acid 0.4 mg PO daily, and PEG 3350 17 g PO daily when needed. She has an allergy to amoxicillin that results in hives upon exposure. She recently got married and has been thinking about starting a family with her husband. Her friend's younger brother was recently diagnosed with schizophrenia and she has some questions for you about the disorder. SJ wants to know if there are any risk factors that are associated with an increased risk of schizophrenia in babies.

Which of the following prenatal and perinatal risk factors has been associated with an increased risk of schizophrenia in babies?

Select one:

☒ a. Obesity ✓

Rose Wang (ID:113212) this answer is correct. Obesity in the mother in the prenatal and perinatal stages has been associated with the fetus having an increased risk of developing schizophrenia.

☐ b. History of epilepsy ✗☐ c. Insulin-dependent diabetes ✗☐ d. Folic acid use ✗

## Correct

Marks for this submission: 1.00/1.00.

TOPIC: Schizophrenia

## LEARNING OBJECTIVE:

Identify prenatal and perinatal risk factors that have been associated with the development of schizophrenia in offspring.

## BACKGROUND:

Certain factors have been found to be associated with an increased risk of schizophrenia when found in the mother in prenatal and perinatal stages. These risk factors include obesity, viral illness, malnutrition, exposure to cats that have been infected with the protozoa *Toxoplasma gondii*, and low birth weight.

## RATIONALE:

## Correct Answer:

- **Obesity** - Obesity in the mother in the prenatal and perinatal stages has been associated with the fetus having an increased risk of developing schizophrenia.

## Incorrect Answers:

- **History of epilepsy** - This is not a known risk factor.
- **Insulin-dependent diabetes** - This is not a known risk factor.
- **Folic acid use** - This is not a known risk factor.

## TAKEAWAY/KEY POINTS:

Maternal prenatal and perinatal obesity has been linked to the development of schizophrenia in the offspring.

## REFERENCE:

- [1] Milliken H. Psychoses. In: Compendium of Therapeutic Choices. Ottawa, ON: Canadian Pharmacists Association. <https://myrxtx.ca>.
- [2] American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Arlington, VA, American Psychiatric Association, 2013.
- [3] Procyshyn RM, Bezchlibnyk-Butler KZ, Jeffries JJ (eds). Clinical Handbook of Psychotropic Drugs, 22nd Edition. Hogrefe Publishing, Toronto, 2017.
- [4] Remington G, Addington D, Honer W, Ismail Z, Raedler T, Teehan M. Guidelines for the Pharmacotherapy of Schizophrenia in Adults. *Can J Psychiatry*. 2017;62(9):604-616. doi:10.1177/070674317720448

The correct answer is: Obesity

## Question 2

IM is a 64-year-old female who presents to your pharmacy clinic with her husband. She was recently

ID: 52443

Correct

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JM is a 47-year-old female who presents to your pharmacy clinic with her husband. She was recently diagnosed with schizophrenia by her family physician because of bizarre behaviour displayed over the past few months. Her husband says that she has been talking to herself lately and the conversations are often difficult to follow. When questioned about it, she says that she hears a man's voice whisper to her every time she makes a movement. She also expresses concerns that their home has been bugged with microphones and cameras that watch her every movement. Her husband appears very distressed and states that this has been a drastic change from who she used to be. JM weighs 204 lbs and has a BMI of 35 kg/m<sup>2</sup>. Her medical history includes dyslipidemia, hypertension, diabetes, osteoarthritis, and hypothyroidism. Her husband is wary of any medication that has the potential to further increase her weight.

Which of the following antipsychotics causes the most weight gain?

Select one:

☒ a. Olanzapine ✓

Rose Wang (ID:113212) this answer is correct. Olanzapine is known to cause significant weight gain.

☐ b. Ziprasidone ✗

☐ c. Aripiprazole ✗

☐ d. Risperidone ✗

**Correct**

Marks for this submission: 1.00/1.00.

**TOPIC:** Schizophrenia

**LEARNING OBJECTIVE:**

Identify which antipsychotic causes the most weight gain.

**BACKGROUND:**

Antipsychotic therapy is considered first line in the treatment and management of schizophrenia. Two classes of antipsychotics exist: first-generation and second-generation antipsychotics. Both classes are associated with various side effects/complications.

First-generation antipsychotics are associated with extrapyramidal symptoms (EPS) more so than second-generation antipsychotics. First-generation antipsychotics are also associated with sedation, orthostatic hypotension/cardiovascular complications, anticholinergic effects, a lower seizure threshold, weight gain, neuroleptic malignant syndrome, hyperprolactinemia and liver function abnormalities. This is not an exhaustive list.

Second-generation antipsychotics are associated with lipid changes, blood glucose changes, some are associated with weight gain, hyperprolactinemia, EPS, headaches, orthostatic hypotension, sedation or insomnia, QT prolongation, rare skin reactions, GI side effects (e.g. constipation), weight gain. Again the severity and combination of side effects will depend on the specific antipsychotic itself.

Antipsychotics that are known to cause major weight gain include low-potency first-generation antipsychotics (e.g., chlorpromazine), clozapine and olanzapine. Other second-generation antipsychotics which cause weight gain (but not as much as clozapine and olanzapine) include quetiapine, risperidone, paliperidone, and aripiprazole. Certain second-generation antipsychotics are associated with minimal or no weight gain such as ziprasidone, asenapine, and lurasidone. The other second-generation antipsychotics fall somewhere in the middle.

**RATIONALE:**

**Correct Answer:**

- **Olanzapine** - Olanzapine is known to cause significant weight gain.

**Incorrect Answers:**

- **Ziprasidone** - Ziprasidone is weight neutral/causes minimal weight gain.
- **Aripiprazole** - Aripiprazole has been found to cause minimal weight gain.
- **Risperidone** - While risperidone can cause weight gain, out of the options given, it does not cause the most weight gain.

**TAKEAWAY/KEY POINTS:**

Olanzapine is an antipsychotic known to cause significant weight gain.

**REFERENCE:**

[1] Milliken H. Psychoses. In: Compendium of Therapeutic Choices. Ottawa, ON: Canadian Pharmacists Association. <https://myrx.ca>.

[2] American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Arlington, VA, American Psychiatric Association, 2013.

[3] Procyshyn RM, Bezchlibnyk-Butler KZ, Jeffries JJ (eds). Clinical Handbook of Psychotropic Drugs, 22nd Edition. Hogrefe Publishing, Toronto, 2017.

[4] Remington G, Addington D, Honer W, Ismail Z, Raedler T, Teehan M. Guidelines for the Pharmacotherapy of Schizophrenia in Adults. *Can J Psychiatry*. 2017;62(9):604-616. doi:10.1177/070674317720448

The correct answer is: Olanzapine

**Question 3**

ID: 50374

Correct

Flag question

JT is a 25-year-old male who presents to your clinic to pick up his medication. He was recently diagnosed with paranoid schizophrenia after he was admitted to the hospital with persecutory delusions and hallucinations. He believed that a neighbour was attempting to hurt him by releasing a poisonous gas substance into his room. He lives at home with both of his parents and his younger



brother. His family says that they have noticed a significant change in JT's personality over the past year. He used to be a straight-A student and was enrolled in university studying to be an accountant. Over the past year, he seems to have lost all interest in school and was removed from university due to poor academic performance. His family also reports that they believe he is depressed because he no longer enjoys playing organized sports with his friends the way he used to. He often isolates himself in his room and spends a lot of time online playing video games. His past medical history is insignificant for any conditions and his medication use only includes diphenhydramine 25 mg PO daily when needed for sleep. He was assessed by the hospital psychiatrist and prescribed a starting dose of risperidone 2 mg daily.

Which of the following is **NOT** an appropriate goal of therapy for patients with schizophrenia?

Select one:

- ☐ a. Eliminate or reduce acute psychotic signs and symptoms ✖
- ☐ b. Implement strategies to promote patient adherence to medication therapy ✖
- ☐ c. Minimize adverse reactions related to medication therapy ✖
- ☒ d. Achievement of complete independence from any form of psychiatric support or assistance ✔

Rose Wang (ID:113212) this answer is correct. Schizophrenia often requires ongoing management and support from healthcare practitioners, family, and social services so independence from these supports is not a goal of therapy.

Correct

Marks for this submission: 1.00/1.00.

TOPIC: Schizophrenia

#### LEARNING OBJECTIVE:

To understand the goals of therapy for schizophrenia.

#### BACKGROUND:

Schizophrenia symptoms include positive and negative symptoms as well as cognitive and mood symptoms.

#### Symptoms of Schizophrenia

| Positive Symptoms   | Negative Symptoms  | Cognitive Symptoms   | Mood Symptoms  |
|---|--|--|--|
| <ul style="list-style-type: none"> <li>Delusions</li> <li>Hallucinations</li> <li>Disorganization of speech, behavior, and thought</li> </ul> | <ul style="list-style-type: none"> <li>Affective flattening</li> <li>Apathy</li> <li>Alogia</li> <li>Anhedonia</li> <li>Avolition</li> </ul> | <ul style="list-style-type: none"> <li>Impaired attention</li> <li>Impaired working memory</li> <li>Impaired executive function</li> </ul> | <ul style="list-style-type: none"> <li>Depression</li> <li>Anxiety</li> <li>Aggression/hostility</li> <li>Suicidality</li> </ul> |

Risk factors for the development of schizophrenia include

- Low birth weight
- Genetics
- Advanced paternal age
- Substance abuse
- Maternal pre-existing conditions (e.g., obesity, malnutrition)

Many street drugs can lead to or worsen psychosis symptoms

- Cocaine
- LSD
- Methamphetamine
- Marijuana
- Ecstasy
- PCP
- Ketamine
- Anticholinergics
- Dopamine agonists
- Levodopa

#### Goals of therapy:

- Eliminate/reduce psychotic signs and symptoms
- Reduce frequency of future episodes
- Prevent relapse
- Minimize adverse reactions related to therapy
- Manage risks of metabolic syndrome, substance abuse, depression and other comorbidities
- Promote adherence by implementing strategies to improve patient's ability to take medications
- Reduce risk of harm and social isolation

Non-pharmacological therapy for schizophrenia includes psychosocial rehabilitation which may include:

- Basic living skills
- Social skills training
- Basic education
- Work programs
- Supported housing

The treatment of schizophrenia includes starting antipsychotic monotherapy except for clozapine. If there is inadequate or no response to the first antipsychotic then switch to another antipsychotic except for clozapine. When switching between two antipsychotics, a cross-taper should be used. If there is an incomplete response then combination therapy can be considered. If treatment is resistant, then clozapine monotherapy can be considered. Therapy should be considered for at least 18 months post-remission or for 2-5 years/lifelong therapy if there are multiple episodes.

### Pharmacological Treatments of Schizophrenia

| Antipsychotic | Comments   |
|---------------|--|
| Quetiapine    | Second-line treatment for depression may be abused for sedative and anxiolytic properties. Causes sexual dysfunction, postural hypotension, increased blood sugar, and sedation.   |
| Risperidone   | Has an IM injection that can be given q2weeks to improve compliance. Causes hyperprolactinemia and sexual dysfunction.   |
| Paliperidone  | A metabolite of risperidone, renal dose adjustments required, can be given IM q4weeks and q3months. Causes hyperprolactinemia.   |
| Asenapine     | BID dosing, should not eat or drink for a minimum of 10 minutes after administration, may have an unpleasant taste or cause tongue numbness/tingling. Causes QTc prolongation  |
| Aripiprazole  | No efficacy past 30 mg/daily, available as IM q4weeks. Well tolerated  |
| Ziprasidone   | BID dosing, give with food (minimum 500 calories), weight gain neutral, baseline QTc needed and stop medication is QTc > 500 msec  |
| Lurasidone    | Used for depressive episodes of bipolar disorder, give with food (minimum 350 calories), weight gain neutral. Well tolerated.  |
| Olanzapine    | Very sedating, increase blood sugar, increase lipids, sexual dysfunction, and negative metabolic effects. Available in short-acting IM injection and oral dissolvable tab, large weight gain associated  |
| Clozapine     | Therapeutic superiority; however, only used for treatment-resistant schizophrenia due to severe side effects including agranulocytosis, myocarditis, weight gain, increased blood sugar, dyslipidemia, sedation, seizures, anticholinergic, orthostatic hypotension, and seizures. Requires regular blood testing. |

First-generation antipsychotics are all equally effective. Mid-potency antipsychotics such as loxapine, perphenazine, or zuclopenthixol should be used. Women with schizophrenia who are pregnant have an increased risk of stillbirth, infant death, prematurity, and infant being small for gestational age. The risks and benefits of antipsychotics need to be evaluated during pregnancy. There have not been enough studies to conclude the safety of antipsychotics in pregnancy. Neuroleptic malignant syndrome can occur with any antipsychotic. Symptoms of NMS include high fever, confusion, rigid muscle, sweating, and increased heart rate. Some symptoms of schizophrenia can improve within 7 days such as agitation, hostility, combativeness, anxiety, and disrupted sleep; however, overall symptom improvement can take 4 - 6 weeks.

#### RATIONALE:

##### Correct Answer:

- **Achievement of complete independence from any form of psychiatric support or assistance** - Schizophrenia often requires ongoing management and support from healthcare practitioners, family, and social services so independence from these supports is not a goal of therapy.

##### Incorrect Answers:

- **Eliminate or reduce acute psychotic signs and symptoms** - Eliminating or reducing acute psychotic signs and symptoms is a goal of therapy for schizophrenia.
- **Implement strategies to promote patient adherence to medication therapy** - Implementing strategies to promote patient adherence to medication therapy is a goal of therapy for schizophrenia.



- **Minimize adverse reactions related to medication therapy** - Minimizing the adverse reactions related to medication therapy is a goal of therapy for schizophrenia.

#### TAKEAWAY/KEY POINTS:

Goals of therapy for patients with schizophrenia include eliminating or reducing psychotic signs and symptoms, reducing the frequency of future episodes, preventing relapse, minimizing adverse reactions related to therapy, managing risks of metabolic syndrome, substance abuse, depression and other comorbidities, promoting adherence by implementing strategies to improve patient's ability to take medications and reducing risk of harm and social isolation. Schizophrenia requires non-pharmacologic therapy with things such as basic living skills, social skills training, basic education, work programs, and supportive housing. Independence from these non-pharmacologic strategies is not a goal of therapy as they should be used in conjunction with pharmacologic treatment.

#### REFERENCE:

- [1] Milliken H. Psychoses. In: Compendium of Therapeutic Choices. Ottawa, ON: Canadian Pharmacists Association. <https://myrx.ca>.  
 [2] American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Arlington, VA, American Psychiatric Association, 2013.  
 [3] Procyshyn RM, Bezchlibnyk-Butler KZ, Jeffries JJ (eds). Clinical Handbook of Psychotropic Drugs, 22nd Edition. Hogrefe Publishing, Toronto, 2017.  
 [4] Remington G, Addington D, Honer W, Ismail Z, Raedler T, Teehan M. Guidelines for the Pharmacotherapy of Schizophrenia in Adults. *Can J Psychiatry*. 2017;62(9):604-616. doi:10.1177/070674317720448

The correct answer is: Achievement of complete independence from any form of psychiatric support or assistance

#### Question 4

ID: 30377

Incorrect

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**KM is 39-year-old male who has been displaying signs of anhedonia, avolition and aphasia. He also states that sometimes it feels like his houseplants are moving and talking to him. His doctor diagnoses him with schizophrenia and prescribes him paliperidone. However, this causes him to develop insomnia and become very agitated, whereby he refuses to continue taking it. He has no other medical conditions and does not take any medication. He used to work as an engineer but has taken sick leave from work as he can't focus. When speaking to him, he states that he would prefer using an injectable drug once he has been stabilized.**

How should KM's situation be managed?

Select one:

- ☐ a. Advise KM that he should continue taking paliperidone and the insomnia will improve ✖
- ☒ b. Suggest that KM's doctor switch his therapy to aripiprazole ✔
- ☐ c. Suggest KM ✖  
start a melatonin supplement
- ☐ d. Suggest KM switch from paliperidone to quetiapine as it can have a sedating effect ✖

*Rose Wang (ID:113212) this answer is incorrect. As KM is experiencing intolerable side effects and a worsening of his condition, he should be switched to a different antipsychotic (preferably an injectable one once stabilized as per the patient's request).*

Incorrect

Marks for this submission: 0.00/1.00.

**TOPIC:** Schizophrenia

#### LEARNING OBJECTIVE:

Recognize and identify signs of neuroleptic malignant syndrome (NMS).

#### BACKGROUND:

Antipsychotics can be categorized into first-generation (i.e., typical) and second-generation (i.e., atypical) antipsychotics. All first- and second-generation antipsychotics, except clozapine, have similar efficacy in treating positive symptoms of psychosis and are considered first-line therapy. First-generation antipsychotics used in the treatment of schizophrenia block the dopaminergic D2 receptor, whereas second-generation (atypical) antipsychotics have a greater affinity for serotonin than dopamine. The binding of these medications to various neurotransmitter receptors accounts for the different side effect profiles. For example, serotonergic antagonism is associated with improvements in negative symptoms and a decreased risk of extrapyramidal symptoms, while histaminergic antagonism is associated with sedation and weight gain. Due to the reduced affinity for dopaminergic receptors, second-generation antipsychotics have reduced extrapyramidal symptoms, decreased tardive dyskinesia and decreased effect on prolactin. The second-generation antipsychotics are associated with an increase in metabolic side effects such as weight gain, hyperlipidemia, and diabetes. As a result, the initial choice in treatment is based on the adverse effects of pharmacotherapy and the patient history. Patients with schizophrenia often present with comorbid psychiatric and general medical disorders such as depression, anxiety, substance abuse, diabetes, and cardiovascular disease, which should be taken into consideration when deciding on treatment. Other factors to account for when deciding on treatment include personal and family history of pharmacotherapy because if a medication has been efficacious before, (personally or within the family) it is likely to be efficacious again. Patients experiencing intolerable side effects and a lack of improvement in their condition should be switched to an alternative medication.

#### RATIONALE:

**Correct Answer:**

- **Suggest that KM's doctor switch his therapy to aripiprazole** - As KM is experiencing intolerable

side effects and a worsening of his condition, he should be switched to a different antipsychotic (preferably an injectable one once stabilized as per the patient's request).

#### Incorrect Answers:

- **Advise KM that he should continue taking paliperidone and the insomnia will improve** - It is unknown whether the insomnia will improve or not. However, this medication is causing KM to be very agitated and thus should be switched to something else.
- **Suggest KM start a melatonin supplement** - As KM is experiencing intolerable side effects and a worsening of his condition, he should be switched to a different antipsychotic (preferably an injectable one once stabilized as per the patient's request).
- **Suggest KM switch from paliperidone to quetiapine as it can have a sedating effect** - While KM does need to be switched to a different antipsychotic, quetiapine does not have a long-acting injectable formulation and he has stated that he would like this.

#### TAKEAWAY/KEY POINTS:

Patients experiencing intolerable side effects and a lack of improvement in their condition should be switched to an alternative medication.

#### REFERENCE:

- [1] Milliken H. Psychoses. In: Compendium of Therapeutic Choices. Ottawa, ON: Canadian Pharmacists Association. <https://myrxbc.ca>.
- [2] American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Arlington, VA, American Psychiatric Association, 2013.
- [3] Procyshyn RM, Bezchlibnyk-Butler KZ, Jeffries JJ (eds). Clinical Handbook of Psychotropic Drugs, 22nd Edition. Hogrefe Publishing, Toronto, 2017.
- [4] Remington G, Addington D, Honer W, Ismail Z, Raedler T, Teehan M. Guidelines for the Pharmacotherapy of Schizophrenia in Adults. *Can J Psychiatry*. 2017;62(9):604-616. doi:10.1177/070674317720448

The correct answer is: Suggest that KM's doctor switch his therapy to aripiprazole

#### Question 5

ID: 30379

Correct

Flag question

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**MK is a 44-year-old female who has been newly diagnosed with schizophrenia by her psychiatrist. She is a high school teacher who lives alone with her two dogs. She reported a recent incident where she was sitting at her kitchen table in the middle of the night and she was unable to move. She remembered thinking that if she moved to the right, her apartment would catch on fire and if she moved to the left, her apartment would become flooded. Since her diagnosis, she has decided to take a leave of absence from work to prioritize her health. Her past medical history includes prediabetes, which was diagnosed last year, and atopic dermatitis. She is managing her prediabetes with diet and exercise and her current BMI is 27 kg/m<sup>2</sup>. Her last HbA1c from three months ago was 6.2%, which decreased from 6.4% at the time of the initial diagnosis. She currently takes the following medication: hydrocortisone 1% cream to be applied to the affected areas on the face BID for 2 weeks and betamethasone valerate 0.1% to be applied to the affected areas on the body BID for 2 weeks.**

Her physician would like to know which of the following antipsychotics would be the most appropriate to start MK on?

Select one:

- ☐ a. Clozapine ✖
- ☒ b. Ziprasidone ✔
- ☐ c. MK's physician can start her on any second-generation antipsychotic ✖
- ☐ d. Olanzapine ✖

Rose Wang (ID:113212) this answer is correct. Ziprasidone has a low incidence of causing glucose and lipid abnormalities and would be a good choice in MK.

Correct

Marks for this submission: 1.00/1.00.

**TOPIC:** Schizophrenia

#### LEARNING OBJECTIVE:

Identify which second-generation antipsychotics are most likely to cause glucose abnormalities.

#### BACKGROUND:

Second-generation antipsychotics are often used to treat and manage schizophrenia. Different antipsychotics in this class have varying degrees of propensity to cause different side effects. Second-generation antipsychotics are associated with lipid changes, blood glucose changes, some are associated with weight gain, hyperprolactinemia, EPS, headaches, orthostatic hypotension, sedation or insomnia, QTc prolongation, rare skin reactions, GI side effects (e.g., constipation), and weight gain. The second-generation antipsychotics most commonly associated with glucose abnormalities are clozapine and olanzapine. Ideally, these antipsychotics should be avoided in patients with diabetes or risk factors for diabetes if a lower-risk antipsychotic is available. Second-generation antipsychotics with the lowest risk of causing glucose abnormalities include ziprasidone, aripiprazole, asenapine, lurasidone, paliperidone, and risperidone. Ideally, these agents should be tried first in patients who have diabetes or have a high risk of developing diabetes (e.g., obesity).

#### RATIONALE:

**Correct Answer:**



- **Ziprasidone** - Ziprasidone has a low incidence of causing glucose and lipid abnormalities and would be a good choice in MK.

#### Incorrect Answers:

- **Clozapine** - Clozapine has a high risk of causing glucose abnormalities and weight gain and would not be the optimal choice in a patient with a high BMI and prediabetes.
- **MK's physician can start her on any second-generation antipsychotic** - Certain antipsychotics are more likely to cause glucose abnormalities and would not be the most appropriate for MK.
- **Olanzapine** - Olanzapine has a high risk of causing glucose abnormalities and weight gain and would not be the optimal choice in a patient with a high BMI and prediabetes.

#### TAKEAWAY/KEY POINTS:

Olanzapine and clozapine are drugs with the highest risk of causing glucose abnormalities and should be avoided in patients with diabetes or high risk of diabetes (e.g. prediabetes). Ziprasidone has a low risk of causing glucose abnormalities and may be one of the preferred options in this patient population.

#### REFERENCE:

- [1] Milliken H. Psychoses. In: Compendium of Therapeutic Choices. Ottawa, ON: Canadian Pharmacists Association. <https://myrx.ca>.  
 [2] Berg J, Stajich G, Zdanowicz M. Atypical Antipsychotic-Induced Type 2 Diabetes. Pharmacy Times. <https://www.pharmacytimes.com/publications/issue/2012/march2012/olanzapine-and-clozapine-atypical-antipsychotic-induced-type-2-diabetes->. Published March 13, 2012. Accessed November 27, 2018.  
 [3] American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Arlington, VA, American Psychiatric Association, 2013. [4] Procyshyn RM, Bezchlibnyk-Butler KZ, Jeffries JJ (eds). Clinical Handbook of Psychotropic Drugs, 22nd Edition. Hogrefe Publishing, Toronto, 2017. [5] Remington G, Addington D, Honer W, Ismail Z, Raedler T, Teehan M. Guidelines for the Pharmacotherapy of Schizophrenia in Adults. *Can J Psychiatry*. 2017;62(9):604-616. doi:10.1177/0706743117720448

The correct answer is: Ziprasidone

#### Question 6

ID: S0405

Correct

Flag question

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**LP is a 65-year-old female with treatment-resistant schizophrenia. She has failed to achieve symptom relief from aripiprazole, asenapine and quetiapine. Her doctor would like her to start clozapine therapy as her symptoms are very distressing. Her comorbidities include anxiety, constipation and hypothyroidism. She is also currently suffering from influenza. Her medications include escitalopram 20mg PO OD, lactulose 15mL OD PRN, docusate 100mg PO BID and levothyroxine 50mcg PO OD. She does not smoke or drink alcohol. She walks her dog daily and enjoys knitting and reading. Her doctor asks you if she can be switched to clozapine, given her history of constipation.**

Which of the following is correct?

Select one:

- ☐ a. LP should not start clozapine therapy due to the risk of fatal intestinal obstruction. Instead, she should be prescribed adjunctive lorazepam to help manage her symptoms. ✖
- ☐ b. LP should try combining two different antipsychotics to help manage her symptoms. ✖
- ☒ c. LP should be assessed for the severity of her constipation and she should be prescribed regular laxatives to help prevent fatal intestinal obstruction. ✔
- ☐ d. LP should be prescribed clozapine and can continue her medications at their current doses. ✖

*Rose Wang (ID:113212) this answer is correct. LP should be assessed for the severity of her constipation and she should be prescribed regular laxatives to help prevent fatal intestinal obstruction.*

#### Correct

Marks for this submission: 1.00/1.00.

**TOPIC:** Schizophrenia

#### LEARNING OBJECTIVE:

Identify clinically significant drug interactions with clozapine.

#### BACKGROUND:

Clozapine is a second-generation antipsychotic often reserved for the treatment of treatment-resistant schizophrenia. Clozapine is metabolized primarily by CYP 1A2 and CYP 3A4 enzymes. Drugs that strongly induce or inhibit these enzymes can impact clozapine levels which may ultimately cause patients harm. Clozapine use is associated with serious side-effects such as agranulocytosis, myocarditis, orthostatic hypotension, seizures, heart failure and constipation which can lead to fatal intestinal obstruction. Patients who take clozapine and have constipation should be assessed for the need for regular laxative use, given the risks associated with clozapine use.

#### RATIONALE:

#### Correct Answer:

- **LP should be assessed for the severity of her constipation and she should be prescribed regular laxatives to help prevent fatal intestinal obstruction.** - LP should be assessed for the severity of her constipation and she should be prescribed regular laxatives to help prevent fatal intestinal obstruction.

### Incorrect Answers:

- **LP should not start clozapine therapy due to the risk of fatal intestinal obstruction. Instead, she should be prescribed adjunctive lorazepam to help manage her symptoms.** - LP has treatment-resistant schizophrenia and would benefit from the use of clozapine.
- **LP should try combining two different antipsychotics to help manage her symptoms.** - Combining antipsychotics has minimal evidence of efficacy in patients with schizophrenia.
- **LP should be prescribed clozapine and can continue her medications at their current doses.** - LP is at a higher risk of fatal intestinal obstruction given her history of constipation and would benefit from a review of her laxatives.

### TAKEAWAY/KEY POINTS:

Patients who take clozapine and have constipation should be assessed for the need for regular laxative use, given the risk for fatal intestinal obstruction with clozapine use.

### REFERENCE:

- [1] Milliken H. Psychoses. In: Compendium of Therapeutic Choices. Ottawa, ON: Canadian Pharmacists Association. <https://myrxbc.ca>.
- [2] Prior TI, Baker GB. Interactions between the cytochrome P450 system and the second-generation antipsychotics. *J Psychiatry Neurosci*. 2003;28(2):99-112.
- [3] American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Arlington, VA, American Psychiatric Association, 2013.
- [4] Procyshyn RM, Bezchlibnyk-Butler KZ, Jeffries JJ (eds). Clinical Handbook of Psychotropic Drugs, 22nd Edition. Hogrefe Publishing, Toronto, 2017.
- [5] Remington G, Addington D, Honer W, Ismail Z, Raedler T, Teehan M. Guidelines for the Pharmacotherapy of Schizophrenia in Adults. *Can J Psychiatry*. 2017;62(9):604-616. doi:10.1177/070674317720448

The correct answer is: LP should be assessed for the severity of her constipation and she should be prescribed regular laxatives to help prevent fatal intestinal obstruction.

### Question 7

ID: 50395

Incorrect

Flag question

Send Feedback

**SL is a 45-year-old male who was diagnosed with schizophrenia more than 20 years ago. His psychiatrist believes that his schizophrenia has been well-controlled with olanzapine 10 mg PO daily. He was recently admitted to the hospital with myocardial infarction and started on new medications by the cardiologist. His new medications include ramipril 2.5 mg one capsule PO once daily, acetylsalicylic acid 81 mg one tablet PO once daily, clopidogrel 75 mg one tablet PO once daily, bisoprolol 2.5 mg one tablet PO once daily, and rosuvastatin 40 mg one tablet PO once daily at bedtime. SL smokes about 20 cigarettes per day but after his recent myocardial infarction, he has expressed interest in quitting. You commend him on his efforts and tell him that there are many options available to him at the pharmacy to help him control his urges to smoke.**

What is the mechanism of the drug interaction that may exist between cigarette smoking and SL's use of olanzapine?

Select one:

- ☐ a. Cigarette smoking inhibits CYP 1A2, thus increasing serum levels of olanzapine ✖
- ☒ b. Cigarette smoking induces CYP 1A2, thus decreasing serum levels of olanzapine ✔
- ☐ c. Cigarette smoking inhibits CYP 2C19, thus increasing serum levels of olanzapine ✖
- ☐ d. Cigarette smoking induces CYP 2C19, thus decreasing serum levels of olanzapine ✖

*Rose Wang (ID:113212) this answer is incorrect. CYP 2C19 does not metabolize olanzapine. Cigarette smoking is known to induce CYP 1A2, resulting in lower serum levels of olanzapine in smokers compared to non-smokers.*

**Incorrect**

Marks for this submission: 0.00/1.00.

**TOPIC:** Schizophrenia

### LEARNING OBJECTIVE:

Identify the interaction between smoking cigarettes and olanzapine.

### BACKGROUND:

Olanzapine is a second-generation antipsychotic drug which can be used for schizophrenia to manage and treat symptoms. Olanzapine can cause weight gain, sedation, metabolic irregularities, orthostatic hypotension, and QTc prolongation. This list is not exhaustive. Olanzapine is metabolized by CYP 1A2 (major pathway), CYP 2D6 (minor pathway), and CYP 3A4 (minor pathway). Inhibition or induction of these enzymes may impact the efficacy and toxicity of olanzapine. Cigarette smoking is known to induce CYP 1A2. This results in lower serum levels of CYP 1A2 substrates (e.g., olanzapine and clozapine) seen in smokers compared to non-smokers. Similarly, in patients who have been chronically treated with olanzapine or clozapine who decide to quit smoking cigarettes, serum levels can be increased resulting in toxicity.

### RATIONALE:

#### Correct Answer:

- **Cigarette smoking induces CYP 1A2, thus decreasing serum levels of olanzapine** - Cigarette smoking is known to induce CYP 1A2, resulting in lower serum levels of olanzapine in smokers compared to non-smokers.



compared to non-smokers.

#### Incorrect Answers:

- **Cigarette smoking inhibits CYP 1A2, thus increasing serum levels of olanzapine** - Cigarette smoking is known to induce CYP 1A2, resulting in lower serum levels of olanzapine in smokers compared to non-smokers.
- **Cigarette smoking inhibits CYP 2C19, thus increasing serum levels of olanzapine** - CYP 2C19 does not metabolize olanzapine. Cigarette smoking is known to induce CYP 1A2, resulting in lower serum levels of olanzapine in smokers compared to non-smokers.
- **Cigarette smoking induces CYP 2C19, thus decreasing serum levels of olanzapine** - CYP 2C19 does not metabolize olanzapine. Cigarette smoking is known to induce CYP 1A2, resulting in lower serum levels of olanzapine in smokers compared to non-smokers.

#### TAKEAWAY/KEY POINTS:

Cigarette smoking induces CYP 1A2, thus decreasing serum levels of CYP 1A2 substrates such as olanzapine and clozapine. Similarly, quitting cigarette smoking can have the reverse effect on serum levels of olanzapine and clozapine, whereby levels are increased.

#### REFERENCE:

- [1] Milliken H. Psychoses. In: Compendium of Therapeutic Choices. Ottawa, ON: Canadian Pharmacists Association. <https://myrxbc.ca>.
- [2] Prior TI, Baker GB. Interactions between the cytochrome P450 system and the second-generation antipsychotics. *J Psychiatry Neurosci*. 2003;28(2):99-112.
- [3] American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Arlington, VA, American Psychiatric Association, 2013.
- [4] Procyshyn RM, Bezchlibnyk-Butler KZ, Jeffries JJ (eds). Clinical Handbook of Psychotropic Drugs, 22nd Edition. Hogrefe Publishing, Toronto, 2017.
- [5] Remington G, Addington D, Honer W, Ismail Z, Raedler T, Teehan M. Guidelines for the Pharmacotherapy of Schizophrenia in Adults. *Can J Psychiatry*. 2017;62(9):604-616. doi:10.1177/070674317720448

The correct answer is: Cigarette smoking induces CYP 1A2, thus decreasing serum levels of olanzapine

#### Question 8

ID: 30397

Correct

Flag question

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Which of the following statements about antipsychotic use is **FALSE**?

Select one:

- ☒ a. Asenapine should be swallowed whole with a full glass of water

Rose Wang (ID:113212) this answer is correct. Asenapine must be placed under the tongue and the patient should be instructed not to eat or drink for a minimum of 10 minutes after administration.

- ☐ b. Lurasidone must be taken with a minimum of 350 calories of food for proper absorption ✗
- ☐ c. Risperidone is available as a long-acting injectable ✗
- ☐ d. Ziprasidone should be discontinued if the patient has a prolonged QTc ✗

Correct

Marks for this submission: 1.00/1.00

**TOPIC:** Schizophrenia

#### LEARNING OBJECTIVE:

Determine the proper administration of commonly used second-generation antipsychotics.

#### BACKGROUND:

Schizophrenia symptoms include positive and negative symptoms as well as cognitive and mood symptoms.

#### Symptoms of Schizophrenia

| Positive Symptoms   | Negative Symptoms  | Cognitive Symptoms   | Mood Symptoms   |
|---|--|--|---|
| <ul style="list-style-type: none"><li>▪ Delusions</li><li>▪ Hallucinations</li><li>▪ Disorganization of speech, behavior, and thought</li></ul> | <ul style="list-style-type: none"><li>▪ Affective flattening</li><li>▪ Apathy</li><li>▪ Alogia</li><li>▪ Anhedonia</li><li>▪ Avolition</li></ul> | <ul style="list-style-type: none"><li>▪ Impaired attention</li><li>▪ Impaired working memory</li><li>▪ Impaired executive function</li></ul> | <ul style="list-style-type: none"><li>▪ Depression</li><li>▪ Anxiety</li><li>▪ Aggression/hostility</li><li>▪ Suicidality</li></ul> |

Risk factors for the development of schizophrenia include

- Low birth weight
- Genetics
- Advanced maternal age

- Advanced paternal age

- Substance abuse

Many street drugs can lead to or worsen psychosis symptoms

- Cocaine
- LSD
- Methamphetamine
- Marijuana
- Ecstasy
- PCP
- Ketamine
- Anticholinergics
- Dopamine agonists
- Levodopa

Non-pharmacological therapy for schizophrenia includes psychosocial rehabilitation which may include:

- Basic living skills
- Social skills training
- Basic education
- Work programs
- Supported housing

## Pharmacological Treatments of Schizophrenia

| Antipsychotic | Comments   |
|---------------|--|
| Quetiapine    | Second-line treatment for depression may be abused for sedative and anxiolytic properties. Causes sexual dysfunction, postural hypotension, increased blood sugar, and sedation.   |
| Risperidone   | Has an IM Injection that can be given q2weeks to improve compliance. Causes hyperprolactinemia and sexual dysfunction.   |
| Paliperidone  | A metabolite of risperidone, renal dose adjustments required, can be given IM q4weeks and q3months. Causes hyperprolactinemia.   |
| Asenapine     | BID dosing, should not eat or drink for a minimum of 10 minutes after administration, may have an unpleasant taste or cause tongue numbness/tingling. Causes QTc prolongation  |
| Aripiprazole  | No efficacy past 30 mg/daily, available as IM q4weeks. Well tolerated  |
| Ziprasidone   | BID dosing, give with food (minimum 500 calories), weight gain neutral, baseline QTc needed and stop medication is QTc > 500 msec  |
| Lurasidone    | Used for depressive episodes of bipolar disorder, give with food (minimum 350 calories), weight gain neutral. Well tolerated.  |
| Olanzapine    | Very sedating, increase blood sugar, increase lipids, sexual dysfunction, and negative metabolic effects. Available in short-acting IM injection and oral dissolvable tab, large weight gain associated  |
| Clozapine     | Therapeutic superiority; however, only used for treatment-resistant schizophrenia due to severe side effects including agranulocytosis, myocarditis, weight gain, increased blood sugar, dyslipidemia, sedation, seizures, anticholinergic, orthostatic hypotension, and seizures. Requires regular blood testing. |

### RATIONALE:

#### Correct Answer:

- **Asenapine should be swallowed whole with a full glass of water** - Asenapine must be placed under the tongue and the patient should be instructed not to eat or drink for a minimum of 10 minutes after administration.

#### Incorrect Answers:

- **Lurasidone must be taken with a minimum of 350 calories of food for proper absorption** - Lurasidone must be taken with a minimum of 350 calories of food for proper absorption.
- **Risperidone is available as a long-acting injectable** - Risperidone is available as a long-acting intramuscular injectable that can be given every 2 weeks for improved compliance.
- **Ziprasidone should be discontinued if the patient has a prolonged QTc** - Ziprasidone should be discontinued if the patient's QTc is >500 msec.

### TAKEAWAY/KEY POINTS:

Asenapine is a second-generation antipsychotic with a unique administration. It must be placed under the



tongue and the patient should be instructed not to eat or drink for a minimum of 10 minutes after administration.

#### REFERENCE:

- [1] Milliken H. Psychoses. In: Compendium of Therapeutic Choices. Ottawa, ON: Canadian Pharmacists Association. <https://myrx.ca>.  
[2] American Psychiatric Association: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Arlington, VA, American Psychiatric Association, 2013.  
[3] Procyshyn RM, Bezchlibnyk-Butler KZ, Jeffries JJ (eds). Clinical Handbook of Psychotropic Drugs, 22nd Edition. Hogrefe Publishing, Toronto, 2017.  
[4] Remington G, Addington D, Honer W, Ismail Z, Raedler T, Teehan M. Guidelines for the Pharmacotherapy of Schizophrenia in Adults. *Can J Psychiatry*. 2017;62(9):604-616. doi:10.1177/070674317720448

The correct answer is: Asenapine should be swallowed whole with a full glass of water

#### Question 9

ID: 50407

Correct

Flag question

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**A 32-year-old male, KL, is diagnosed with treatment-resistant schizophrenia. He has been stabilized on clozapine for the past six months. He has no known allergies. He presents to the Emergency Department, where you are the Clinical Pharmacist on duty, with symptoms of a urinary tract infection. The attending physician plans to prescribe an antibiotic and asks for your input.**

Which of the following antibiotics should be **AVOIDED** with clozapine due to a drug interaction?

☒ Ciprofloxacin ✓

*Rose Wang (ID: 113212) this answer is correct.  
Ciprofloxacin is a known CYP1A2 inhibitor; which could lead to increased clozapine levels in the body.*

☐ Amoxicillin ✗

☐ Nitrofurantoin macrocrystals ✗

☐ Ceftriaxone ✗

Correct

Marks for this submission: 1.00/1.00

**TOPIC:** Schizophrenia

#### LEARNING OBJECTIVE:

Identify drug interactions that may occur with antipsychotics.

#### BACKGROUND:

Clozapine undergoes extensive hepatic metabolism primarily mediated by cytochrome P450 (CYP) enzymes, notably CYP1A2 and CYP3A4. Medications that modulate the activity of these enzymes can significantly influence the metabolism of clozapine. Inhibitors of CYP1A2, such as fluvoxamine, ciprofloxacin, and some antidepressants, can impede the breakdown of clozapine, resulting in elevated plasma concentrations. Likewise, inhibitors of CYP3A4, like ketoconazole and clarithromycin, may also increase clozapine levels by affecting its metabolism. Conversely, inducers of CYP1A2 (e.g., tobacco smoke, rifampicin) and CYP3A4 (e.g., carbamazepine, phenytoin) can enhance the clearance of clozapine, potentially reducing its therapeutic efficacy. These interactions have implications for both efficacy and safety, as altered clozapine levels may lead to treatment inefficacy or an increased risk of adverse effects. Regular monitoring of clozapine levels and clinical response is advisable to optimize treatment outcomes and minimize the risk of adverse events.

#### RATIONALE:

##### Correct Answer:

- **Ciprofloxacin** - Ciprofloxacin is a known CYP1A2 inhibitor, which could lead to increased clozapine levels in the body.

##### Incorrect Answers:

- **Amoxicillin** - There is no known interaction between amoxicillin and clozapine.
- **Nitrofurantoin macrocrystals** - There is no known interaction between nitrofurantoin macrocrystals and clozapine.
- **Ceftriaxone** - There is no known interaction between ceftriaxone and clozapine.

#### TAKEAWAY/KEY POINTS:

Clozapine has a narrow therapeutic index; therefore, caution is advised when starting or stopping other medications. As clozapine is metabolized by CYP1A2 and CYP3A4, administration of any medications known to inhibit or induce these enzymes may affect the plasma concentrations of clozapine.

#### REFERENCE:

- [1] Product Monograph Clozaril (2021). HLS Therapeutics Inc. [https://pdf.hres.ca/dpd\\_pm/00061281.PDF](https://pdf.hres.ca/dpd_pm/00061281.PDF)

The correct answer is: Ciprofloxacin

#### Question 10

ID: 50411

**JJ, a 36-year-old man, has a medical history that includes schizophrenia and allergic rhinitis. He is taking ziprasidone 20 mg PO BID with meals, alongside cetirizine 10 mg PO PRN for allergic rhinitis symptoms. JJ has just been diagnosed with pneumonia and presents a prescription for levofloxacin**

750 mg PO daily for 5 days.

Which of the following statements is true?

- ☐ Levofloxacin may worsen symptoms of schizophrenia ✖
- ☒ There is a risk of QT prolongation with the combination of levofloxacin and ziprasidone ✔
- ☐ Levofloxacin may reduce the concentration of ziprasidone ✖
- ☐ There are no drug interactions between ziprasidone and levofloxacin ✖

*Rose Wang (ID: 113212) this answer is correct. Ziprasidone and levofloxacin are not recommended for use together as they can increase the risk of QT prolongation.*

**Correct**

Marks for this submission: 1.00/1.00

**TOPIC:** Schizophrenia

**LEARNING OBJECTIVE:**

Identify clinically significant drug interactions with ziprasidone.

**BACKGROUND:**

Unlike some other antipsychotics, ziprasidone exhibits a lower risk of causing weight gain and metabolic side effects. However, one significant concern associated with ziprasidone is its potential to prolong the QT interval on an electrocardiogram (ECG), which can lead to a rare but serious heart rhythm disorder called torsades de pointes. This QT prolongation risk is relatively higher compared to several other antipsychotics. Ziprasidone is contraindicated with medications that have demonstrated QT-prolonging effects, such as levofloxacin.

**RATIONALE:**

**Correct Answer:**

- **There is a risk of QT prolongation with the combination of levofloxacin and ziprasidone** - Ziprasidone and levofloxacin are not recommended for use together as they can increase the risk of QT prolongation.

**Incorrect Answers:**

- **Levofloxacin may worsen symptoms of schizophrenia** - Levofloxacin is not known to affect symptoms of schizophrenia.
- **Levofloxacin may reduce the concentration of ziprasidone** - Levofloxacin is not known to affect the concentrations of ziprasidone.
- **There are no drug interactions between ziprasidone and levofloxacin** - A drug interaction does exist between ziprasidone and levofloxacin.

**TAKEAWAY/KEY POINTS:**

Ziprasidone can cause QT-prolongation and should be avoided with other medications that can also affect the QT interval.

**REFERENCE:**

[1] Procyshyn RM, Bezchlibnyk-Butler KZ, Jeffries JJ (eds). Clinical Handbook of Psychotropic Drugs, 22nd Edition. Hogrefe Publishing, Toronto, 2017.

The correct answer is: There is a risk of QT prolongation with the combination of levofloxacin and ziprasidone

Finish review